

Larval abundance and dispersal as critical factors in the recovery of native Olympia oysters in Coos Bay

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Project Title:

A collaborative approach to address reproduction, larval supplies, and settlement during recovery of native Olympia oysters

Location:

Coos Bay, Oregon

Goal:

Generate new science to support development of a conservation and recovery plan for Olympia oyster populations throughout Coos Bay

Partners:

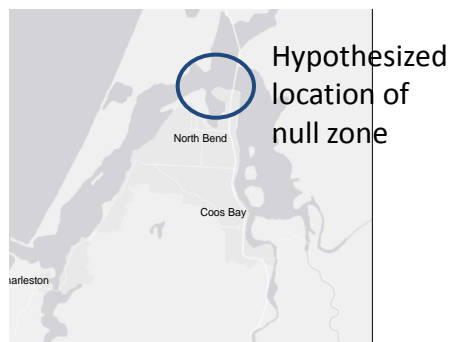
Oregon Institute of Marine Biology; South Slough National Estuarine Research Reserve; Oregon State University; Oregon Sea Grant; Oregon Department of Fish and Wildlife

Timeline:

Nov 2011 to Sep 2013

Is there a null point within the Coos Bay estuary? If so, how does it change between seasons?

The Coos Bay estuary is topographically complex and the hydrodynamics within the tidal basin are complicated. During falling tides water masses from the upper region of the bay do not typically reach the mouth of the estuary by the time the tide begins to rise. Consequently, the water mass will be pushed again toward the upper estuary during flooding tides. If this occurs around the same point during a defined interval (*i.e.*, a season), the location is known as a *null point*: a point of oscillation within the estuary that is driven by the interaction of freshwater output and oceanic tides that allows for retention during tidal exchanges. The null point is an area of no net movement between tides. Preliminary data indicates that farthest point downstream within Coos Bay where a null point occurs in the summer is near the prominent bend in the estuary. Planktonic oyster larvae within or upstream of the null point should experience a decreased risk of being flushed into the open ocean. Drogues will be used to follow water movement during all seasons from both the most riverine oyster populations during falling tides, and most oceanic populations during rising tides to determine if a hydrodynamic mechanisms exists for retention or transport into the null point.

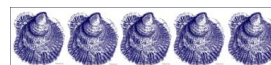
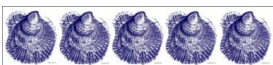


Are there consistent indicators of a null point other than drogue data?

The null point is associated with distinctive physical features within estuaries on the East Coast, although few studies have been conducted on the West Coast. First, it has been correlated with the highest concentration of suspended particles. Second, due to the slow current speeds that allow sediment to settle, with river currents on the order of cm s^{-1} , and very slow bottom water column currents with a mean near 0 cm s^{-1} , it has the highest rate of sediment accumulation. In addition, the highest concentration of phytoplankton has been well correlated with the turbidity maximum and we would thus expect high Chl *a* concentrations as well. We will use CTD transects to characterize the water column throughout the estuary. These data will be paired with drogue data compare conditions within, upstream, and downstream of the null point.

Is the larval distribution pattern related to the null point or to water quality parameters?

Historically, commercial oyster shells were placed in locations favored for spat collection, indicating that there are areas with estuaries where more larvae are present, or where preferential settling conditions occur. Understanding and protecting these specific zones, whether coastal or estuarine, is important when considering management or recovery plans, or marine protected areas. We will use plankton tows at three sites within the estuary to examine these relationships further: 1 site will be located 1 km downstream of the null zone, 1 site within the hypothesized null zone, and 1 site located 1 km above the null zone. We expect the abundance of larvae to be higher within the null zone or above, compared to the downstream site.



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Stakeholder Involvement:

Stakeholders participate as members of the Olympia Oyster Recovery Advisory Committee. Input and issues raised by the stakeholder committee are used to help direct and guide the scientific work completed by graduate students and faculty at the Oregon Institute of Marine Biology.

Support:

Financial support for the project is provided by a grant from the NOAA-NERRS Science Collaborative.

Learn More:

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Do *Ostrea lurida* larvae make tidally-timed vertical migrations, or settle in the mud during low tide?

Preliminary data from stratified plankton tows (0-5 m, 5-10 m) suggest that *Ostrea lurida* larvae do not make tidally-timed migrations. However, the channel is routinely 12-13 m deep, and 15 m deep in some locations, leaving the bottom 2-5 m previously unsampled. In Puget Sound, WA, *O. lurida* larvae have been found in the bottoms 1 m of the water column, in addition to being buried in the mud during low tides in the intertidal zone. We will conduct stratified plankton tows as described above, add a plankton sled to sample the lowest 1 m, and sample intertidally at low tide to confirm that *O. lurida* larvae do not make tidally timed vertical migrations.



Are larval supplies and settlement related throughout the estuary?

Lack of hard substrate is commonly cited as a limiting factor for reestablishing historically high abundances of *O. lurida*. However, Wasson (2010) found that an abundance of hard substrate was not a predictor of oyster presence or abundance, suggesting there may be low larval supply. We propose to determine the relationship between settlement and larval supply by using settlement plates and larval traps. If larval abundance is high but there is very little settlement, further research will be required to determine why the site is unappealing for settlement.

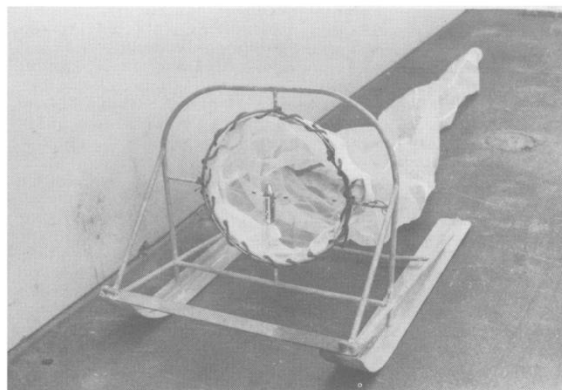


FIGURE 26. Towing sled and net used to sample plankton at ocean bottom. Photo by Paul W. Wild.

Can larval abundance be correlated with water quality parameters?

Previous studies have examined the relationship between water quality parameters (temperature, salinity, DO, pH, fluorescence, nutrient concentration, turbidity) and adult *O. lurida* abundance in California. Results indicate that the mean values for these parameters differ between sites where oysters were highly abundant and absent, with sites of high abundance having the smallest range of values. We propose to measure temperature, salinity, light intensity, pH, fluorescence and turbidity at 6 sites equipped with larval traps within the estuary to determine if water quality parameters are correlated with larval abundance.

